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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

TRAN, BINH X

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 03/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/021,531

Applicant(s)

PHAN ET AL.

Examiner

Binh X Tran

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ex

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 9-16 and 26-28 is/are pending in the application.
- 4a) Of the above claim(s) 26-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-7, 9-16 and 26-28 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 26-28 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The examiner previously made an election/restrictions between apparatus claims, (Group I claims 1-16) and process claims (Group II claims 17-25). In response to the election/restrictions requirement, the applicant elected Group I without traverse in the Paper mailed on 7-31-2003.
2. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 26-28 (drawn to process) are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

3. The drawings were received on 1-16-2004. These drawings are acceptable.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 1-7, 9-15 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In line 6-7 of claim 1, "overetch parameters provided to the controller by the device model" (emphasis added) lacks antecedent basis. In line 4 of claim 1, the applicants defines that "the device model that includes layout data". Applicants do not indicate that the device model include "overetch parameters". Therefore, it is unclear from the claims whether the "overetch parameters" and "layout data" are the same variables or not.

Claims 2-7 and 9-15 are indefinite because they directly or indirectly depend on indefinite claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1-7, 9-10, 12-14, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumihashi et al. (US 6,136,721) in view of Chao et al. (US 5,780,315).

Respect to claim 1, Kumihashi discloses an apparatus comprising:
a metal etcher for performing overetching (Fig 8, 13);
a wafer (target device) placed in the metal etcher;
an overetch controller (21) coupled to the metal etcher, to control overetching and to control removal of an overetch amount of the material from the wafer.

Kumihashi fails to disclose a device model including layout data to provide overetch parameter/data layout to the overetch controller. Chao discloses charted experience having plurality of data point (read on "device model including data layout") to provide overetch parameter to the overetch controller (Fig 2B, Fig 3, col. 5-6). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi in view of Chao by using a device model including data layout to provide overetch parameter to the controller because this would produce optimum etching results without the necessity to predetermine the pattern density of the wafer before loading into the wafer.

Respect to claim 2, Kumihashi teaches the target device is a wafer having at least one semiconductor device and the metal layer is aluminum (col. 18 line 50 to col. 19 line 21).

Respect to claims 3-4, Kumihashi fails to disclose the wafer has an oxide layer covering with the remaining residue of aluminum from the metal etch process. In an

etching system, Chao discloses that the wafer has an oxide layer (col. 4 lines 65-67). Chao further teaches that the un-removed aluminum residues remain on the wafer after the main aluminum-etching step (col. 5 lines 25-39). Since the oxide layer is located on the wafer and the residues exist after the metal etching step, some portion of the residues must cover the oxide layer. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi in view of Chao by having the oxide layer covering with residue because the oxide layer can be used as the mask during the metal etching step.

Respect to claim 5, Kumihashi teaches the etcher is capable of performing metal etching and metal overetching (Fig 9, 12, col. 20 lines 53-55). Respect to claim 6-7, Kumihashi teaches that the overetching controller (21) has the sensor 20 (i.e., photo detector) to measure the feedback data of the target device during overetching and using the feedback data to control the overetching (Fig 8-9, col. 11 line 41 to col. 12 line 8).

Respect to claim 9, Chao teaches the controller is capable of controlling the endpoint time of overetch and main etch (read on "overetch time controller", col. 5 lines 8-19). Chao further teaches the overetch controller comprises a set of charted experiences (read on "set of etch control model") and a control system using a computer.

Respect to claim 10, Chao teaches the controller is capable of determine and detect the endpoint of the overetch process. The limitation of claim 12 has been discussed above under Chao's reference. Respect to claim 13-14, Chao teaches the

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wafer is identified and selected at least one charted experience data from the set of two dimensional charted data store in the computer (col. 6 lines 24-40).

Respect to claim 16, Kumihashi teaches a system comprising:

a wafer (read on "target device");

a metal etching means for removing an overetch amount of material from the wafer (Fig 8, 13);

an overetch means (21) for controlling the metal etching means, the overetch control means includes a set of control data.

Kumihashi fails to disclose that the control means comprise a set of etch control model, a timer means for initiating and halting the metal etching means and a control means for selecting at least one relevant model from the set of etch models and determining the overetch endpoint. Chao teaches the controller is capable of measuring the time and controlling the endpoint time of overetch and main etch for the metal layer (read on "a timer means for initiating and halting the metal etching means", col. 5 lines 1-19). Chao further discloses the overetch controller comprises a set of charted experiences (read on "set of etch control model") and a control system for selecting at least relevant data from the charted experiences using a computer to determine the overetch endpoint (Fig 2b, col. 5; read on "a controller means for selecting at least one relevant model from the set of etch control models and determine an overetch endpoint).

It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi in view of Chao by using a set of etch control model, a

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timer means for initiating and halting the metal etching means, a control means for selecting at least one relevant model from the set of etch control models. The combination of Kumihashi in view of Chao would produce optimum etching results without the necessity to predetermine the pattern density of the wafer before loading into the wafer.

Allowable Subject Matter

9. Claims 11, 15 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose or suggest the either overetch system having the set of etch control models include layout data, etchable area and percentage of etchable area, or the set of etch control models comprises three dimension information.

Response to Arguments

11. The applicant's argument with respect to claims 11 and 15 is persuasive. Therefore, the examiner withdraws the 35 U.S.C 103(a) rejection with respect to claims 11 and 15.

12. Applicant's arguments filed 01-16-2004 with respect to claims 1-7, 9-10, 12-14 and 16 have been fully considered but they are not persuasive.

The applicants argue, "Chao, et al. fails to disclose or teach a device model let alone a device model that includes layout data". According to applicants, "The chart of experiences, as disclosed by Chao, et al., is simply a chart of empirical data mapping

main etch endpoints to overetch times. The chart of experiences is not a device model". The examiner disagrees. The applicants define the "device model" is a "software base model of the target device" in page 5 of the specification. Chao clearly discloses that the charted experience is the software model of the wafer and it is stored in computer memory. Chao's charted experiences include thickness values, pattern density values, main etch endpoint and overetch endpoint time (col. 5, Fig 3). The examiner, therefore, still maintains that Chao's charted experiences having plurality of data points read on applicants' "device model that includes data layout".

The applicants further argue that the examiner has indicated that claim 16 has been rejected, but has failed to state any reasons for the rejection. The examiner disagrees. The examiner acknowledges that the examiner did not provide a detail line-by-line rejection for claim 16 in previous office action. However, each individual limitation of claim 16 is equivalent with some limitations in claims 1-7, 9-10, 12-14, which the examiner already discussed. In previous office action, the examiner clearly indicated that "the limitation of claim 16 has been discussed above" (See the last sentence of the second paragraph in page 5) in order to avoid repeating the same argument. Since the applicants request a detail written rejection for claim 16, the examiner provides a detail rejection in this office action base on Kumihashi and Chao references. The applicants are reminded that the detail rejection is not a new ground of rejection for claim 16.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh X. Tran

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

